

## Homework 4

**Due date:** September 28

1. The product rule says that for  $h : \mathbb{R}^n \rightarrow \mathbb{R}$  and  $f : \mathbb{R}^n \rightarrow \mathbb{R}^m$  one has

$$(fh)'(x_0) = f'(x_0)h(x_0) + f(x_0)h'(x_0)$$

where the last term is obtained from multiplying a column with a row matrix. Can you verify that by calculating the derivative of

$$F \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} (3x + 5y)(e^x + e^y) \\ (4x + 6y)(e^x + e^y) \end{pmatrix}.$$

2. Calculate approximately  $f(1.1)$  for

$$f(x) = \int_0^x \sqrt{x - \cos^2(s)} ds.$$

(Hint: You might want to use the integral formula for cosecant at some later point of your argument).